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ABSTRACT

The college-level computer assisted instruction (CAI) courses, one in French, the other in Remedial English, were the bases for the data presented here. Each CAI course is briefly outlines. A summary is then presented of the students' completion records and attitude changes. In the case of the Remedial English course, it is noted that these records served as feedback in solving a programing problem. Data is presented in tabular form at the end of the document. (JY)

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BEHAVIORAL AND ATTITUDINAL RESPONSES OF COLLEGE STUDENTS TOWARD COMPUTER-ASSISTED INSTRUCTION

A paper presented at the 1970 Annual Meeting, American Educational Research Association, at Minneapolis, Minnesota

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Behavioral and Attitudinal Responses of College Students Toward Computer-Assisted Instruction [1]

Introduction

The data we will present are based on two college-level CAI courses, one in French, the other in Remedial English. They were offered in cooperation with the IBM Company's Thomas J. Watson Research Center near New York City at various campuses of the City and State Universities of New York, which formed a CAI network. What we can present today represents only a small fraction of the data collected for evaluation purposes, but my intention is not to report on the evaluation as such but to illustrate the kinds of data that have been or might be derived from student records prepared by the computer on the basis of student responses to the CAI course materials.

The French Course

Instructional Procedures and Assumptions

In the beginning French course it was intended that CAI should supplement, consolidate and reinforce what the instructor taught in class. It was assumed that the instructor would follow a fixed lesson sequence and set the pace and that the students generally would be expected to "keep up with the class". (In college-level foreign language courses there is usually a tacit assumption that those who cannot hold the pace will drop out.) The CAI course was closely coordinated with a textbook; in fact, it was originally prepared by one of the joint authors of a leading French textbook for beginners, Dr. Julian Harris, but he did not do the computer programming. Thus the CAI course, and the student manual that goes with it, are divided into lessons that exactly correspond with those in the

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[1] This research was conducted by the Institute for Research in Learning and Instruction, under the direction of Dr. Edward D. Lambe.

book, but each CAI lesson consists of only three sections (called "units") whereas the textbook lessons have several sections. It was intended that the content of a CAI lesson should be manageable by an average student in approximately an hour, and that students should devote approximately two hours per week to the CAI part of the course. In actual use the specific arrangements differed at different campuses; in some instances CAI sections were excused from one class period per week; in others they were excused from assigned homework; in one case the CAI course was, at least nominally, additional to the usual requirements of students.

Student-Computer Communications

You must realize, of course, that CAI installations are quite diverse. We will describe only some of the salient features of the system and equipment used in the present instance as they impinge on the individual student.

At the student terminal material is presented either by electric typewriter or by tape recorder with earphones, and the student responds by using the typewriter keyboard. A typical response might require from one to 15 or 16 words. The student's response--as, for instance, his transcription of dictation heard through the earphones--is compared with a model stored in the computer memory. The parts of it that conform exactly to the model are then retyped by the machine, but parts that do not conform are deleted and are replaced by underlining. The student then tries again. If his response matches the model on the first try or subsequently the machine types "c" for "correct" and proceeds to the next item. If the student fails in several attempts, the correct form is typed out by the machine. The computer compares the student's successes and failures in each unit with a predetermined standard and requires repetition of a unit from the beginning when the failure rate is too great. (Parenthetically, when I say "the machine does thus and so", I should be saying "the computer programmer does those things", for he is the one who determines the

exact details of what the machinery does. I will come back to this point.)

No alternative sequences of lesson material are provided. In other words, the program is linear: the sequence of items in a unit is fixed and the sequence of the units is fixed.

Student Performance

The paper on which the student and the computer (i.e. the programmer) type out messages to each other provides a record, of course, of the student's performance and, incidentally of the machine's performance. These records are voluminous and hard to use--you get bushels of paper--but are very revealing. A summary of part of one student's record, page one of your handout, shows the types of exercises presented on certain days, the number of trials this student required in reaching the programmer's standard of satisfactory performance, and some comments typed in by the student. An attractive feature of this program was that it invited student comment at the end of each unit.

At the beginning of each CAI session the student's name, the date and the time of day appear on the typescript, which I will call "terminal printout" from now on. At the end of the session the time is given, so the duration can be obtained. Page two of your handout shows what progress each of five students was making week by week over a period of seven weeks at the beginning of the second semester, and how much time they were putting in at the CAI terminal, as well as their average rates of completion of these units, three of which were supposed to represent a day's lesson. We see immediately, on the upper part of the page, that while students A and B worked rather steadily along, the other three worked in spurts. Although the unevenness of accomplishment reflects different rates of progress, shown at the bottom of the page, it is even more a result of the irregularities in working time. The patterns of application document what we may have known about students but have tended to ignore--except occasionally to denounce their erratic behavior and extol absolute

regularity of study at all times. Student E, who accomplished most in seven weeks, was not the fastest student nor was he a steady worker. He just took the bit in his teeth and ran through seven lessons in one week against the normal expectation of two. This all plays havoc with the assumption that the CAI course is to be closely coordinated with the progress of a class, which is imagined to be keeping more or less together at a pace set by the instructor. These crude figures, derived from a quick analysis of terminal printout, suggest that records of student behavior in CAI learning environments should be examined in much more detail. Also, it is obvious that the laborious task of abstracting and summarizing from the flow of communications the significant information for particular purposes should itself be delegated to the computer. A small start has been made in that direction, but from what we have seen of several CAI applications, most of this yet remains to be done.

Now, if you will turn to page three of your handout, you will see the results of some rather simple minded computer record-keeping on the French course. On the vertical scale we now have number of CAI lessons completed instead of number of units and we have a time span of 14 weeks not counting a two weeks' break in mid-semester. The interesting features here are the relatively steady progress over-all, reflected by the medians, the fact that an average of 26 lessons were completed in 14 weeks, vindicating the combined judgement of the author and the programmer about the amount and difficulty of content to be put into the CAI course, and the familiar pattern of divergence between the upper and lower ends of the distributions, further evidence--if any were needed--of the falsity of some of the assumptions on which foreign language teaching in the seventh decade of the 20th Century still was predicated. I want to remind you, before we leave this page, that one should resist the temptation to conceptualize the divergence of the set of distributions simply as a representation of a family of uniform learning curves differing only in slope. We saw earlier that this is not so.

Student Attitudes

Time will not permit us to say much about attitudes toward the French course. Despite numerous complaints about particular problems and irritations general attitudes toward the course were surprisingly favorable. Perhaps the students were intrigued with the general idea of CAI experimentation. Perhaps they enjoyed manipulating the machinery. In a survey of student opinion at the end of the first semester the question, "How much benefit do you get from computer-assisted instruction?" was asked. The responses were two-to-one for "very much" or "much", as compared with "little" or "very little." A similar question applied to language laboratories showed overwhelming disapproval not only by CAI students but also by students in regular French sections. By a margin of three to one the CAI students indicated that they would choose a CAI section again if they were starting French anew and were given a choice. By a margin of four to one they said they would recommend this type of CAI French course to their friends. One may wonder at this enthusiasm, but it seems to have been genuine, at least at that time. I will not try to explain it further.

Remedial English

In describing the Remedial English course I will not go into as much detail as we did on the French course. In this case the students had been admitted to the City University of New York under a special program called SEEK--Search for Education, Elevation and Knowledge--and it was fully anticipated that many or most of them would need intensive and extensive remedial instruction in English. The CAI program was again designed to supplement and reinforce regular classroom instruction, but was not so closely linked to the classwork as was the French. It was limited to specific objectives in the areas of spelling, punctuation and capitalization, and English grammar. The student terminals were of the same type as those used in the French course, and the general nature of the communication between the student and the computer programmer was similar. Unfortunately, the entire experiment was conducted under a severe pressure

of time because the computer itself was scheduled to be retired. The course material was being developed by Dr. Peter Rosenbaum and was ready for use only barely in time for the beginning of the semester. The installation of the equipment at the center where the students lived and had their classes was rushed, also.

From the report on the Remedial English we have chosen to present here only the table, on page four of your handout, that corresponds to the table of frequency distributions for the French course. Here some lines have been added that represent the experimenter's initial expectations for the group. It is interesting that one fast student barely exceeded the anticipated rate of lesson completions. Clearly, however, something was wrong with the way the course was working out with average and slow members of the group. A degree of sophistication was revealed, however, in that the author and programmer were able to take account of the feedback of information from the campus and set some of the internal standards more appropriately after the halfway point in the course. The rising medians after the 8th week reflect the effects of this action. One might be tempted to suppose that the students at the low ends of the frequency distributions had effectively dropped out of the CAI course, but in reality such was not the case. Except for one or two, they were just plodding slowly along.

Conclusions

CAI course materials should be tested and revised on the basis of experience in use. Why is this not done as a matter of course? Perhaps because they are expensive to generate and represent an investment their owners want to protect. Perhaps because computer programmers are highly paid and some of them may assume that their own educational judgements are nearly infallible. In a CAI course such judgements seem to have a tendency to get locked in unless specific provision is made for revision based on pertinent information. Future experimenters would be well advised to set up data collection and analysis procedures within the CAI system by which the program itself could be developed and improved. This should include detailed data on student use of time among

other things. The basic technology permits far more adaptive applications of CAI than we are currently seeing.

Summary of Part of One Student's Record (Abstracted from Terminal Printout)

Date	Type of Unit	Number of Trials	Comments
2/14/68	Dictation	4	
	Aural comprehension	1	
	Reading comprehension	5	I would like to be permitted more mistakes before repeating.
2/19/68	Translation	1	
	Substitution-transformation	1	This is a little too easy.
2/21/68	Reading comprehension	3	So close to the end? The machine is a sadist?
3/4/68	Substitution-transformation	1	
	Reading comprehension	6	
3/13/68	Dictation	1	
	Aural comprehension	1	This was fun-let's do it again
	Reading comprehension	4	For one mistake. Are you for real?
3/25/68	Reading comprehension	3	It is unfair to make me do it over after only one mistake.

Supplement to-
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Number of CAI Units Completed

Week	Student				
	A	B	C	D	E
1	2	3	11	-	9
2	6	9	13	4	14
3	12	14	13	8	1[illegible]
4	15	20	17	8	14
5	21	26	17	11	35
6	22	33	21	32	39
7	29	38	22	34	43

Hours per Week

Week	Student				
	A	B	C	D	E
1	1.0	0.8	1.9	0.0	2.0
2	2.0	1.7	0.6	1.7	2.0
3	2.3	1.7	0.0	1.7	0.0
4	2.0	1.6	0.8	0.0	0.0
5	1.9	1.8	0.0	1.2	6.9
6	1.0	1.9	0.7	6.4	1.6
7	2.2	1.0	0.7	0.5	1.6
Totals	12.4	10.5	4.7	11.5	14.1

Units per Hour

	Student				
	A	B	C	D	E
Average	2.34	3.62	4.68	2.96	3.05

Frequency Distributions of CAI French Students at Brooklyn College

By Number of CAI Lessons Completed

CAI Lesson Completed	Weeks from beginning of Second Semester						
	2nd	4th	6th	8th	10th	12th	14th
35							1
34							4
33							1
32						1	1
31						1	4
30						2	-
29						2	-
28						1	1
27					1	2	2
26					-	1	1
25					2	1	2
24					3	3	2
23					2	-	1
22					-	1	1
21					-	3	1
20				4	3	5	2
19				3	4	-	1
18				1	3	2	1
17			2	-	1	1	0
16			1	1	1	-	2
15			4	6	2	2	1
14			1	2	1	-	
13		1	1	3	2	-	
12		1	3	3	2	1	
11		1	3	1	-		
10		3	6	2	2		
9		4	3	1			
8		10	3	2			
7		3					
6	2	2	-				
5	4	1	-				
4	7	2	1				
3	5	1	1				
2	6	1					
1	3						
0							
Medians	3	8	11	15	19	22	26

Frequency Distributions and Targets for SEEK Students in CAI Remedial English by Number of CAI Lessons Completed

CAI Lesson Completed	Weeks from Beginning of First Semester					
	2nd	4th	6th	8th	10th	12th
31				1	9	24
30				-	1	-
29				-	2	1
28				-	2	1
27				-	2	1
26				-	1	2
25				1	3	3
24				-	1	2
23				-	1	-
22				-	-	-
21				-	3	2
20				1	3	2
19				2	-	-
18			1	3	-	-
17			-	-	-	-
16			-	-	1	-
15			1	-	3	-
14			1	1	-	-
13			1	-	2	-
12			2	1	-	-
11			1	1	-	-
10		1	-	2	1	2
9		-	1	1	1	1
8		2	3	2	1	1
7	1	5	5	7	5	5
6	-	5	7	5	1	1
5	-	6	3	4	3	3
4	3	6	6	4	1	1
3	11	7	7	7	4	1
2	9	6	5	7	3	1
1	18	15	9	4	1	1
0	16	2	5	2	1	1
Medians	1.2	3.2	4.0	5.5	18.5	26.0

Target for fast students

Target for average students

Target for slow students